many of the remaining Bengal tigers and greater one-horned rhinos.

But researchers point out that this hotspot of biological diversity is highly vulnerable to climate change.

The WWF has used the report to launch its Climate for Life campaign to bring the concerns about the future of these species to wider attention.

The WWF is just one of the many organisations developing their lobbying positions ahead of the key Copenhagen meeting on carbon emissions. “We are calling on governments to commit industrialised countries to a 40 per cent reduction in greenhouse gas emissions by 2020 compared to 1990 levels,” the organisation says.

“There is no room for compromise on this issue,” says Wright. “Without these cuts the Himalayas face a precarious future — impacting both the unique wildlife and the 20 per cent of humanity who rely on the river systems that arise in these mountains.”

But conservationists face problems when the politicians meet in Copenhagen. There are growing concerns about who should bear the cost of reducing carbon emissions and a new report, published last month, argues that the UN’s estimate of the costs of adapting to reduced carbon emissions — $100 billion — could be up to three times higher. The author of the report, from the International Institute for Environment Development and the Grantham Institute for Climate Change, believes the amount of money available in Copenhagen will be a key factor in whether a climate change agreement is reached.

At this summer’s G8 summit in Italy, the participating wealthy nations agreed to limit global temperature rise to 2 degrees Celsius — above which most scientists believe significant climate change consequences will occur. They agreed an 80 per cent cut in greenhouse gas emissions by 2050 and a 50 per cent cut in global emissions but failed to outline how they will meet those targets.

Conservationists will be hoping for significant outcomes from Copenhagen about how such targets can be met if biodiversity, as recently described in the eastern Himalayas, is to have a chance of coping with future climate.

Q & A

Kevin Padian

Kevin Padian began his career at Colgate University, studying invertebrate paleontology and the history and philosophy of science. He received a Master of Arts in Teaching there and went on to teach middle school science before attending graduate school at Yale, where he received his PhD in Biology in 1980. From there he went to Berkeley, where he is now in his thirtieth year of teaching and research. His lab’s work focuses on how major adaptive changes have originated in the history of vertebrates. He is a Fellow of the AAAS and a recipient of the Carl Sagan Award for the popularization of science. He is also the long-time President of the National Center for Science Education in Oakland, California. In 2005 he served as an expert witness in the ‘intelligent design’ trial in Dover, Pennsylvania.

What turned you on to biology in the first place? From my earliest memory, any book or article that was about the life of the past completely fascinated me. My favourite place in the world was the American Museum of Natural History in New York. I never got enough of it, and I still think it’s the greatest museum on Earth. But it wasn’t until my first year in college that I began to learn about evolution. This, sadly, is common in America.

Do you have a ‘favourite’ scientific work? *The Origin of Species,* hands down. Every time I read it I learn more about Darwin’s genius. I love best to teach it, because it turns on so many students — and comparatively few biologists have actually read it. This is too bad, because the seeds of most non-molecular concepts in biology are germinated there. And we ignore how far Darwin brought biology unless we actually go back and read what was known at the time he was writing: an interesting exercise I do with students is to take out the *Encyclopedia Brittanica* from the 1850s, when Darwin was composing the *Origin*. I ask the students to list the topics they’d like to look up to see what was known at the time. We fill the blackboard with terms, but when they open the books, they don’t find any of them. That’s because the questions of biology were posed in such different ways, and many of the words were used differently or hadn’t been invented.

What advice would you offer someone contemplating a career in biology? Always think where you’re going to be in five years. Move slowly but inexorably toward that goal. Take courses in graduate school. Don’t sit in your lab the whole time. Become broadly as well as deeply trained. Make sure your dissertation explores several kinds of problems. Take a bite out of a big question for your thesis. Don’t do a ‘me too’ study that just uses the same techniques on a different subject. And if you find you don’t want to become a clone of your advisor, rejoice: you’ve learned what you don’t want to do. You can use your training in government, education, publishing, journalism, film-making, and many other occupations that need first-hand scientific training.

If you knew what you know earlier on, would you still pursue the same career path? Yes, but I’d have more research funds because I’d also know what stocks to have bought and sold.

What scientific advance has been most influential to your field during your career? The evo-devo revolution. If we had known in the 1970s about Hox genes, BMPs, and all the wonderful things described in books like Sean Carroll *et al.*’s *From* DNA to *Diversity*, we would have been on our knees in gratitude and wonderment. Before, our models of evolution were pretty much stuck in Mendelian genetics of binary structural genes and one- and two-locus models of population change. We despaired, as C.H. Waddington had done, that the problem of “*how you get horses and tigers and things is largely outside the [Modern] Synthesis*.” Now, we have this incredible concatenation of developmental genetics, ontogeny, paleontology, and phylogenetics, with a century of understanding populational change beneath it. It’s a great time to be an evolutionary biologist.

What’s the greatest ethical challenge to your field? The commercial collection and sale of fossils, especially those exported illegally. Most people don’t realize that when fossil skeletons and eggs from other countries are sold at auction, they've been illegally obtained. Oh, they have papers, but they aren't legitimate as far as their governments are concerned. If the US and other countries prohibited the import of such fossils, as well as the export of their own fossils, much of this problem would disappear. A related problem arises when scientists try to publish on specimens that are in private collections — including so-called 'museums' that are privately owned and have no provision for the public reception and conservation of these fossils if and when these "museums" fail. More and more journals are refusing to publish such manuscripts, and we can only hope that this will become universal.

You've worked a lot on public science education. What should scientists take away from the experience of someone in the trenches? The teachers are in the trenches day in and day out. They need scientists to listen to them and to support them, to accept them as colleagues and to help when they can.

How does biology education need to change? Right now there is no national curriculum in the US, and there won't be anytime soon. So we have a system in which 50 states have 50 different sets of curriculum objectives, standards, frameworks, and other prescriptives. This drives publishers nuts because they have to adapt to differences in coverage and emphasis, and it hits concepts like evolution the hardest. That's criminal, because evolution is the central organizing principle of biology. I'm convinced that this won't get better until the coverage of evolution is stronger in college texts and curricula. Surveys show that only about a third of US respondents have a problem with evolution and religion. These are fundamentalists, and there is no need to convert or argue with them. But another 40–50% of mainstream Americans would be open to evolution, except that they get all this creationist misinformation. It seems obvious that if we spent more time in our textbooks talking about how tetrapods came up on land, how birds evolved from dinosaurs, how whales went back into the oceans, the average American would not be so vulnerable to the claims of creationists. But we have to start putting this evidence more strongly in college biology books before we can expect it to trickle down to high school.

Is the media attention paleontology gets a good thing, and if not, how could it get better? The conventional wisdom is that it is, but I haven't yet seen a study that tests or quantifies that hypothesis. Does media coverage directly or indirectly translate into public or private support for research? I have no evidence that it does. Interest in paleontology has grown over the past few decades because more research has yielded more discoveries and in turn more publications. Much of what we thought we knew thirty years ago about dinosaurs and other extinct creatures is now obsolete. The question is, how will the public learn about this, inasmuch as so little of it gets into textbooks? The answer is: through the media. This places an unwanted burden on the shoulders of the press and documentary-makers. They don't want to be teachers; they want to be journalists and entertainers. But science journalists differ from city-hall and agony-column journalists, because they have a responsibility to ask about and convey to their audiences the standards of evidence and the methods used in the fields to answer their questions. Extraordinary claims require extraordinary evidence. "How would you know if you were wrong?" is a necessary question to ask. It would also be useful if the press were to declare a moratorium on reporting on what my colleague Angela Milner has called 'locker-room comparisons' — the biggest, the longest, the oldest new dinosaur or fossil of the week. The best stories in science are the paradigms that are changing — how we are learning new things about the lives of dinosaurs, for example — not merely their vital statistics.

What's the best thing about being a scientist today? The young people who are coming up in the ranks to replace us. They're absolutely amazing, and I have no doubt that our generation will leave the profession in wonderful hands.

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Quick guide

The postsynaptic density

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What is the postsynaptic density (PSD)? Seen by electron microscopy (EM) as an electron-dense thickening of the postsynaptic membrane of excitatory synapses, the PSD contains a high concentration of structural and signaling proteins connected physically and functionally to postsynaptic glutamate receptors and transsynaptic adhesion molecules. This marked thickening of the postsynaptic membrane is a hallmark of excitatory synapses (hence termed asymmetric), contrasting with the symmetric inhibitory synapses that lack a prominent PSD. PSDs can be biochemically purified as insoluble multi-protein complexes by repeated detergent extraction of brain synaptosomes.

What is the size of the PSD? The PSD can be disk-like or highly irregular in shape. Large PSDs often have one or more perforations. Disk-like PSDs have an average diameter of 360 nm (range 200–800 nm) and a thickness of 40 nm (30–50 nm). The molecular mass of an average PSD has been estimated at ~1 gigadalton, although this might be an overestimate because PSDs recruit a large amount of proteins (like calcium–calmodulin-dependent protein kinase II, CaMKII) during ischemia and biochemical purification.

Where is the PSD located? The PSD is usually found at the tip of dendritic spines. Spines are tiny, ~0.5–2 μm long membrane protrusions on dendrites that receive the majority of excitatory synaptic inputs. The PSD is directly apposed to the presynaptic active zone — the site of release of the neurotransmitter glutamate (Figure 1A). The space underneath the PSD is occupied by actin filaments, the major cytoskeletal component of dendritic spines. Neighboring the PSD are endocytic zones, which are 'hot spots' for endocytosis of glutamate receptors (Figure 1A).

What is the PSD made of? Proteomic studies have identified several hundred